Physics: *Refraction and Lenses HW*

Indices of Refraction for Various Substances

SUBSTANCE	n	SUBSTANCE	n
benzene	1.501	glass, crown	1.52
carbon tetrachloride	1.461	glass, flint	1.66
cubic zirconia	2.20	glycerin	1.473
diamond	2.419	ice (at 0°C)	1.309
ethyl alcohol	1.361	quartz, fused	1.458
fluorite	1.434	water	1.333

Set 1: Snell's Law

1. Light traveling in air enters a slab of a transparent substance. The incident ray makes an angle of 41.3° with the normal, and the refracted ray makes an angle of 25.9° with the normal. Find the index of refraction of the transparent substance.

2. Find the angle of refraction for light that enters water from air at an angle of 28.4° to the normal.

3. Fill in the missing spaces in the table.

	from (medium)	to (medium)	Θ_i	Θ_r
a.	crown glass	flint glass	29.5°	
b.	air		17.4°	12.7°
c.	quartz	diamond	34.2°	

ANSWERS: 1. 1.51   2. 20.9°   3a. 26.8°   3b. ethyl alcohol   3c. 19.8°

Set 3: Lenses

11. A bottle is placed 23.4 cm in front of a converging lens with a focal length of magnitude 18.2 cm. Find the image distance <u>and</u> the magnification. Decide real/virtual and inverted/upright.

12. A detective examines a clue by holding his magnifying glass (a converging lens) 7.73 cm away from an object. The magnifying glass has a focal length of magnitude 11.6 cm. Find the image distance <u>and</u> the magnification. Decide real/virtual and inverted/upright.

13. A key is placed 24.0 cm in front of a diverging lens having a focal length of magnitude 10.6 cm. Find the image distance <u>and</u> the magnification. Decide real/virtual and inverted/upright.

Set 4: Critical Angle

14. Find the critical angle for light traveling from benzene into air.

15. Determine the critical angle for light traveling from glycerin into ice.

16. Calculate the critical angle for light traveling from diamond into fluorite.

17. Which has a smaller critical angle in air, carbon tetrachloride or cubic zirconia? Show your work.

ANSWERS:
11. q = 81.9 cm, M = –3.50, R, I
12. q = –23.2 cm, M = 3.00, U, V
13. q = –7.35 cm, M = +0.306, U, V
14. 41.78°
15. 62.71°
16. 36.36°
17. cubic zirconia